TADPOLES OF THE SOUTHEASTERN UNITED STATES COASTAL PLAIN Denise R. Gregoire

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I NTRODUCTI ON

The intent of this guide is to provide biologists and laypersons with a usable field reference for identifying tadpoles of most of the frog species found in the Southeastern United States Coastal Plain region. Specifically this guide is focused on the 23 species of frogs found at Southeast ARMI inventory and monitoring sites in Georgia, South Carolina, and Florida, including St. Marks, St. Vincent, Lower Suwannee, Cedar Keys, Okefenokee, Harris Neck, and Savannah National Wildlife Refuges and the Katharine Ordway Preserve-Swisher Memorial Sanctuary in Putnam County, Florida.



ARMI Biologist Dr. Margaret Gunzburger dip-netting for tadpoles on St. Vincent National Wildlife Refuge.

This guide includes all species of frogs found in the Southeast ARMI region of the continental United States (TN, NC, SC, GA, AL, FL) except those species not found at any of the current ARMI monitoring sites (*Hyla andersonii, Pseudacris feriarum, Pseudacris brachyphona, Pseudacris brimleyi, Acris crepitans, Rana okaloosae, Rana palustris, Rana sylvatica, Bufo americanus, Bufo fowleri,* and the introduced species *Bufo marinus* and *Eleutherodactylus planirostris*).

The objective of the Amphibian Research and Monitoring Initiative of the United States Geological Survey is to understand the status and trends of amphibian populations throughout the United States and to evaluate potential causes of population declines. A critical component of achieving this objective is to be able to identify the species of amphibians present at each sampling site. Tadpoles are considered difficult to identify by most biologists, yet monitoring tadpole populations may be more feasible than monitoring adult frogs because for many species tadpoles are present in habitats for longer periods of time than adults and thus may be the life stage encountered most often.

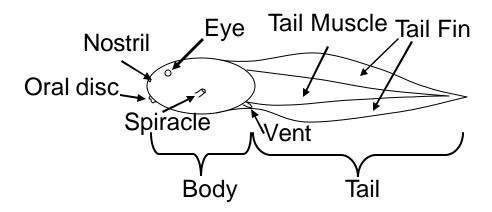
For many species of frogs that occur over a wide geographic range there is considerable variation in tadpole appearance and size across the range. In addition, tadpole appearance may vary over a small geographic scale due to habitat characteristics such as the amount of tannins in water or the presence of fish predators. We obtained estimates of maximum size and descriptions of tadpole appearance from a variety of literature sources (see references) and our own observations, however we recognize that for many species sufficient data are lacking. Due to this variation no field guide will present a perfect guide to the appearance of tadpoles in nature, thus it is recommended to use this guide in conjunction with other guides listed in the References section.

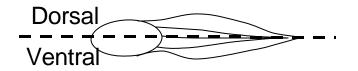
This guide will be continually updated with new photographs and information from ARMI sampling sites throughout the Southeastern United States. Eventually the guide will be expanded to include all 35 species of frogs found in this region. Please send comments and suggestions to address on inside front cover.

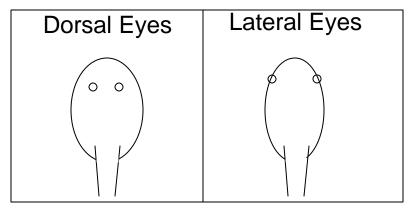
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TADPOLE MORPHOLOGY







Tadpoles viewed from above

BY SIDE TADPOLES SIDE

8



American Bullfrog Rana catesbeiana





Pig Frog Rana grylio



River Frog Rana heckscheri







Southern Leopard Frog Rana sphenoephala

Gopher Frog Rana capito



Squirrel Treefrog Hyla squirella



Green Treefrog Hyla cinera

Green Treefrog Hyla cinera

Gopher Frog Rana capito



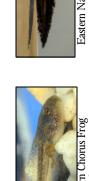


Cuban Treefrog Osteopilus septentrionalis

Pine Woods Treefrog Hyla fenoralis



Southern Chorus Frog Pseudacis nigrita



Ornate Chorus Frog Pseudacris ornata



Eastern Spadefoot Scaphiopus holbrookii



Little Grass Frog Pseudacris ocularis

Southern Cricket Frog Acris gryllus

Cope's Gray Treefrog Hyla chrysoscelis



Oak Toad Bufo quercicus



Southern Toad Bufo terrestris

Cope's Gray Treefrog Hyla chrysoscelis

Spring Peeper Pseudactis crucifer

BULLFROG

Rana catesbeiana



HABITAT

These frogs are habitat generalists and can be found in lakes, ponds, sluggish portions of streams, slow rivers and man-made drainage ponds.

BREEDI NG SEASON

Spring/Fall, March-October

SI MI LAR TADPOLES

Rana grylio, Rana sphenocephala, Rana clamitans





APPEARANCE

Head

Dorsal eyes.

Body

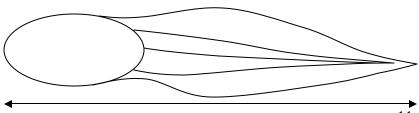
Rana catesbeiana tadpoles are extremely variable. Typical coloration of Coastal Plain populations is olive green dorsally with an immaculate creamy yellow belly. However, coloration can vary from grayish green to olive to brown and even bright green.

Tai l

The body and tail may be completely covered with small black dots or the dots may be completely absent.

APPROXIMATE MAXIMUM SIZE

Large: Over 4 inches, 100mm. May take 1-2 years to develop.



PIG FROG

Rana grylio



HABITAT

These aquatic frogs are habitat generalists and live areas with emergent aquatic vegetation in lakes, marshes, rivers, ponds, swamps and streams.

BREEDING SEASON

Spring/Fall, March-September

SIMILAR TADPOLES

Rana virgatipes, Rana catesbeiana, Rana clamitans





APPEARANCE

Head

Dorsal eyes. Small tadpoles have light golden band around the body behind the eyes (similar to Rana heckscheri).

Body

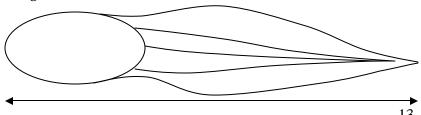
Rana grylio tadpoles are dark green to brown and slightly mottled. The throat is solid black. The belly is yellowish and may be patterned with a dark reticulated pattern. The intestinal coil is not visible through the skin.

Tai l

Tail fins may be either clear or covered with dark blotches with a longitudinal row of dark dots on the dorsal tail fin.

APPROXIMATE MAXIMUM SIZE

Large: Over 4 inches, 100 mm.



CARPENTERFROG

Rana virgatipes



HABI TAT

Lives in close association with sphagnum bogs and streams

BREEDING SEASON

Spring/Summer, April -August

SI MI LAR TADPOLES

Rana grylio



APPEARANCE

Head

Dorsal eyes.

Body

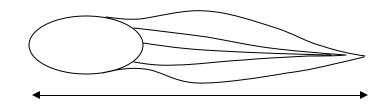
Rana virgatipes tadpoles are dark, greenish gray to almost black with a few widely scattered black spots.

Tai l

The tail is not strongly spotted but along the dorsal fin is a longitudinal series of dark dots that may fuse into a solid line, and a parallel dark line along the tail muscle.

APPROXIMATE MAXIMUM SIZE

Large: 3.5 inches, 90mm.



RIVER FROG

Rana heckscheri



HABI TAT

Not only do these frogs inhabit rivers, they can also be found in floodplain swamps, ponds, lakes and marshes associated with rivers. Tadpoles can be seen swimming in large schools.

BREEDI NG SEASON

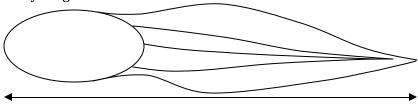
Spring/Summer, April-August

SIMILAR TADPOLES

Small tadpoles: Rana grylio, large tadpoles: None

APPROXIMATE MAXIMUM SIZE

Very Large: Over 4 inches, 25-100 mm.







APPEARANCE

Larger tadpoles are very distinct and do not resemble any other tadpoles in the Southeast.

Head

Dorsal reddish eyes. Small tadpoles (~1 inch) have a light golden band around the body just behind the eyes (similar to *Rana grylio*).

Body

Small $\it Rana\ heckscheri\ tadpoles\ (\sim 1\ inch\),\ have\ a\ dark,\ almost$ black body. As the tadpoles grow their color lightens becoming a deep olive

Tai l

The tail muscle is bi-colored being darker on top and lighter below. The fins start out clear and become opaque white edged with a dark black outline.

SOUTHERN LE OPARD FROG

Rana sphenocephala



HABI TAT

This species is a habitat generalist found in almost any body of water including ponds, lakes, ditches, streams, river edges and even brackish water.

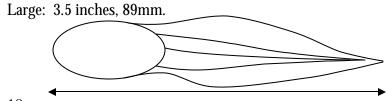
BREEDI NG SEASON

Year round, peaks in early Spring

SI MI LAR TADPOLES

Rana capito, Rana clamitans, Rana grylio

APPROXIMATE MAXIMUM SIZE







APPEARANCE

Head

Dorsal eyes. Tadpole usually possess a vertical white line down the middle of the snout between the nostrils. This can be a key identifying feature.

Body

Body color of *Rana spehenocephala* tadpoles is variable. They can be light or dark, usually an olive green with distinct black mottling. The belly is a light pink and the intestinal coil may be seen under the skin.

Tai l

The tail fin has a low to medium arch, and the fins range from being clear to covered with large dark spots.

GOPHER FROG

Rana capito



HABI TAT

Ephemeral fishless ponds, adults inhabit the burrows of Gopher Tortoises (*Gopherus polyphemus*) in sandy scrub areas.

BREEDI NG SEASON

Year round, but only in response to heavy rainfall

SI MI LAR TADPOLES

Rana sphenocephala





APPEARANCE

Head

Dorsal eyes.

Body

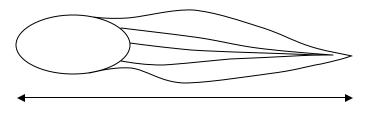
Rana capito tadpoles have deep bodies that are overall greenish and lack spots. The belly is cream to yellow and the intestinal coil is not visible.

Tai l

The tail is long with a medium sized arch of the dorsal fin. Fins can be either clear or with spots.

APPROXIMATE MAXIMUM SIZE

Large: 3.5 inches, 90 mm.



BRONZE FROG

Rana clamitans



HABI TAT

This secretive, aquatic frog is a resident of ponds, swamps, streams, river edges and lake shores.

BREEDING SEASON

Spring/Summer, April-August

SI MI LAR TADPOLES

Rana catesbeiana, Rana sphenocephala, Rana grylio





APPEARANCE

Head

Dorsal eyes.

Body

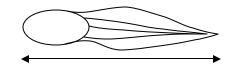
Rana clamitans tadpoles may be dark or pale greenish brown to gray and densely speckled with a light cream colored belly. These tadpoles are large, but not deep bodied.

Tai l

The tail is fairly elongated with a low arch and fins can be clear or speckled.

APPROXIMATE MAXIMUM SIZE

Medium: 1.2-2.5 inches, 30-65mm.



GREENTREEFROG

Hyla cinerea



HABI TAT

Found in many aquatic habitats such as swamps, lakes, streams and ponds with emergent vegetation, typically in permanent aquatic habitats.

BREEDI NG SEASON

Spring/Summer, March-September

SI MI LAR TADPOLES

Hyla chrysoscelis, Hyla squirella, Hyla femoralis





APPEARANCE

Head

Lateral eyes. A key feature for identification of this tadpole is a pale yellow stripe on either side of the head that stretches from the nostril to the eye.

Body

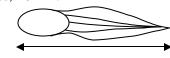
Hyla cinerea tadpoles are olive-green.

Tai l

The tail may be spotted with dark or light spots and can be washed with red similar to *Hyla chrysoscelis* and *Hyla femoralis*.

APPROXIMATE MAXIMUM SIZE

Medium: 1.6 inches, 40mm.



SQUIRRELTREEFROG

Hyla squirella



HABI TAT

A common "backyard" species found in a variety of habitats in their range including woodlands, pasture ponds, gardens and roadside ditches.

BREEDING SEASON

Spring/Summer, April-August

SI MI LAR TADPOLES

Hyla chrysoscelis, Hyla cinerea



APPEARANCE

Head

Lateral eyes.

Body

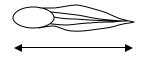
This is an extremely variable and difficult to identify tadpole. Color ranges from brown to green. The belly is yellow with a black center.

Tai l

The tail is long and deep with a flagellum. Fins are clear or with few dark flecks.

APPROXIMATE MAXIMUM SIZE

Small: 1.25 inches, 32 mm.



BARKING TREEFROG

Hyla gratiosa



HABI TAT

Large, deep, fishless ponds.

BREEDI NG SEASON

Spring/Summer, March-August

SI MI LAR TADPOLES

Pseudacris ornata



APPEARANCE

Head

Lateral eyes.

Body

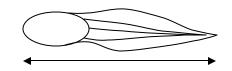
Small *Hyla gratiosa* tadpoles (<45mm) are all over lightly colored green to greenish yellow with a clear body and a dark saddle spot midway down the dorsal tail muscle. Larger tadpoles lose the dark saddle and are transparent yellow.

Tai l

The tail is long with clear fins and tail muscle and a highly arched dorsal fin that extends anteriorly to the eyes.

APPROXIMATE MAXIMUM SIZE

Medium: 2-2.75 inches, 50-70mm.



PINE WOODS TREEFROG

Hyla femoralis



HABI TAT

Typically breeds in ephemeral fishless habitats including pine flatwoods, forested or shrub wetlands, cypress swamps, lakes, ponds and wet prairies.

BREEDI NG SEASON

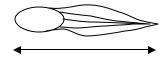
Spring/Summer, April-August.

SIMILAR TADPOLES

Hyla andersonii, Hyla cinerea, Hyla chrysoscelis, Pseudacris ocularis

APPROXIMATE MAXIMUM SIZE

Small: 0.8-1.5 inches, 20-40 mm.







APPEARANCE

Head

Lateral eyes.

Body

Hyla femoralis tadpoles have dark bodies, olive to greenish black, the sides and throat are purplish and the center of the belly is yellow.

Tai l

The tail is deep with wide fins and a long flagellum. A distinct pale stripe runs laterally down the middle of the tail muscle starting at the body and extending halfway or more down the length of the tail. The dorsal trail fin extends anteriorly onto the head. The upper and lower tail fins are mottled with large dark blotches and the fins are often washed with bright red coloration similar to *Hyla chrysoscelis* and *Hyla cinerea*..

COPE'S GRAY TREEFROG

Hyla chrysoscelis



HABI TAT

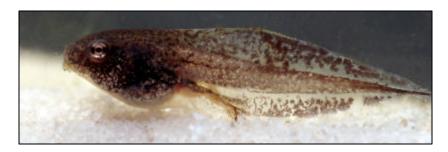
Typically breeds in fishless habitats, including wet woodlands, ponds and swamps.

BREEDI NG SEASON

Spring/Summer, April-August

SI MI LAR TADPOLES

Hyla cinerea, Hyla femoralis, Hyla squirella





APPEARANCE

Head

Lateral eyes.

Body

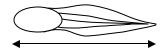
Hyla chrysoscelis tadpoles are extremely variable in coloration and pattern. Their color ranges from dark tan to gray to golden. The belly is cream colored and the intestinal coil is visible.

Tai l

The tail is long with a high tail fin and prominent flagellum. It can be clear or mottled with dark blotches and is often, but not always washed with orange or red coloration similar to *Hyla femoralis* and *Hyla cinerea*.

APPROXIMATE MAXIMUM SIZE

Medium: 1.25-1.75 inches, 32-45mm.



BIRD-VOICEDTREEFROG

Hyla avivoca



HABI TAT

In permanent wooded swamps and along creeks and rivers.

BREEDI NG SEASON

Spring/Summer, April-July.

SIMILAR TADPOLES

None



APPEARANCE

Head

Lateral eyes. There is a white or reddish line between the eyes and extending from each eye to the nostrils, forming a triangle on the top of the head.

Body

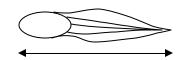
The body of a *Hyla avivoca* tadpole is mostly black with a darkly pigmented throat.

Tai l

The tail is also dark with light silver to reddish bands dorsally.

APPROXIMATE MAXIMUM SIZE

Medium: 1.6 inches, 40mm.



CUBANTREEFROG

Osteopilus septentrionalis



HABI TAT

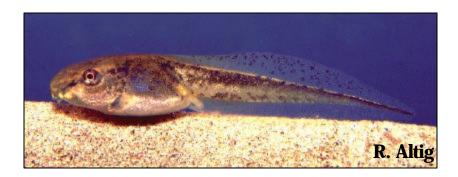
This is an invasive non-indigenous species in Florida. Found in natural areas in parts of its introduces range, as well as in retention ponds, drainage ditches and other areas associated with human habitation.

BREEDI NG SEASON

Spring/Summer, April-August

SIMILAR TADPOLES

Hyla cinerea, Hyla squirella



APPEARANCE

Head

Lateral eyes.

Body

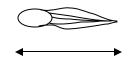
Osteopilus septentrionalis tadpoles have a rounded heavily pigmented body with a transparent belly making the intestinal coil visible.

Tai l

The tail fins are flecked with dark mottling.

APPROXIMATE MAXIMUM SIZE

 $Medium: \ 1.0 \hbox{-} 1.25 \ inches, 26 \hbox{-} 32 mm.$



SOUTHERN CRICKET FROG

A cris gryllus



HABI TAT

A habitat generalist found in almost every aquatic habitat including ponds, lakes, bogs, marshes, swamps and rivers.

BREEDI NG SEASON

Year round, peaks in Summer, April-September

SIMILAR TADPOLES

Small ranid tadpoles



APPEARANCE

Although it is a hylid, this tadpole looks remarkably like a ranid.

Head

Dorsal eyes.

Body

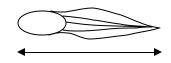
Acris gryllus tadpoles are light olive to dark beige with a pinkish belly.

Tai l

The tail is long with a low arch and a row of dark spots along the dorsal tail muscle. The tail often has a dark "ink stained" tip. Although this is good identifying feature, it is not uncommon for the tail tip to lack this distinct coloration.

APPROXIMATE MAXIMUM SIZE

Medium: 1.5 inches, 38mm.



SPRING PEEPER

Pseudacris crucifer



HABI TAT

This secretive frog is seldom seen except in breeding season. It inhabits woodlands, marshes and bogs, near small temporary or semi-permanent ponds.

BREEDING SEASON

Winter, October-March.

SI MI LAR TADPOLES

Pseudacris ornata, Pseudacris ocularis



APPERANCE

Head

Lateral eyes. The snout has a square appearance when viewed from above.

Body

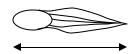
Pseudacris crucifer tadpoles can be dark greenish brown to almost transparent with vague stippling.

Tai l

They have a medium sized tail, mottled tail muscle same color as body, but with more pattern. The fins may be clear or with blotches.

APPROXIMATE MAXIMUM SIZE

Small: 1.2 inches, 30mm.



SOUTHERN CHORUS FROG

Pseudacris nigrita



HABI TAT

Inhabits pine flatwoods, wet meadows, roadside ditches, moist wetlands, flooded fields and other open habitats.

BREEDING SEASON

Winter/Spring, January-April

SI MI LAR TADPOLES

Pseudacris crucifer, Pseudacris ocularis, Pseudacris ornata,



APPEARANCE

Head

Lateral eyes.

Body

Pseudacris nigrita tadpoles are dark brown with pale dorso-ateral stripes and a light coppery belly.

APPROXIMATE MAXIMUM SIZE

Small: 0.7 inches, 18mm.



ORNATE CHORUS FROG

Pseudacris ornata



HABI TAT

This species can be found in wet prairies, roadside ditches, cypress swamps, pine flatwoods and shallow temporary bodies of water with extensive emergent vegetation.

BREEDI NG SEASON

Winter/Spring, December-March

SI MI LAR TADPOLES

Pseudacris crucifer, Pseudacris nigrita, Hyla gratiosa



APPEARANCE

Head

Lateral eyes.

Body

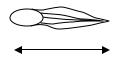
Pseudacris ornata tadpoles are reddish brown with light dorsolateral lines extending from snout along the length of the body. They have a light belly and a clear throat.

Tai l

The tail has a highly arched dorsal fin. Smaller specimens have a bi-colored tail muscle (darker dorsally than ventrally) that becomes more uniformly pigmented as the tadpole grows larger.

APPROXIMATE MAXIMUM SIZE

Small: 1.0 inch, 25 mm.



LITTLE GRASS FROG

Pseudacris ocularis



HABI TAT

Inhabits grassy ponds, roadside drainage ditches, flooded meadows, swamps and marsh edges.

BREEDI NG SEASON

Year round, peaks in early Summer

SI MI LAR TADPOLES

Hyla femoralis, Pseudacris crucifer



APPEARANCE

Head

Lateral eyes.

Body

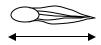
The body of a *Pseudacris ocularis* tadpole is dark olive green with scattered black spots, especially in larger tadpoles. Light dorso-lateral stripes extending from the eye to the tail may be apparent The belly is pinkish.

Tai l

The tail is long with pale ventral muscle coloration and darker dorsal muscle coloration, sometimes with a light line on dorsal tail muscle above dark line. The fins are clear with large blotches along the edge.

APPROXIMATE MAXIMUM SIZE

Small: 0.9 inches, 23mm.



EASTERN NARROW-MOUTHED TOAD

Gastrophryne carolinensis



HABI TAT

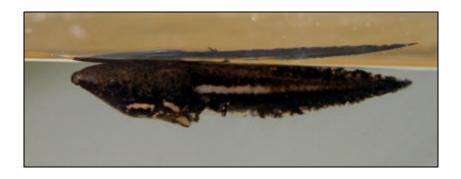
Shallow, grassy edges of ponds and lakes, ditches, puddles. Adults are accomplished burrowers and can be found near bodies of water in damp soil, under logs, beneath rock and in leaf litter.

BREEDI NG SEASON

Spring/Summer, March-October

SIMILAR TADPOLES

None



APPEARANCE

Head

A pointed head with lateral eyes.

Body

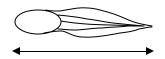
Gastrophryne carolinensis is another Southeastern species that has a very unique tadpole. They are dorso-laterally flattened such that the body looks square from above. Their bodies are dark, almost jet black. The belly is also dark with lateral whitish blotches and the intestinal coil cannot be seen through the skin.

Tai l

On the tail, a lateral white stripe extends from the body and runs part way down the middle of the tail muscle. Their single spiracle is ventral to their anus, which is unlike any other Southeast species.

APPROXIMATE MAXIMUM SIZE

Small: 1.0-1.9 inches, 25-48mm.



EASTERN SPADEFOOT

S caphiopus holbrookii



HABI TAT

Ephemeral fishless ponds. These frogs inhabit forests with sandy, loose soil. They usually spend the day in underground burrows, emerging at night to feed. Tadpoles form large, conspicuous schools

BREEDI NG SEASON

Breeding occurs after extremely heavy rains of several inches or more which stimulates the entire population to breed. Breeding occurs in ephemeral or temporary wetlands. Tadpoles develop quickly and the metamorphs typically emerge within three weeks.

SI MI LAR TADPOLES

Bufo quercicus, Bufo terrestris







Ventral view

Dorsal view

APPEARANCE

Head

Dorsal close set eyes. Pointed beak-like snout.

Body

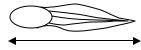
Scaphiopus holbrookii tadpoles have broad bodies that are wider near the eyes than the vent. Their bodies are dark bronze to brown in color with small close set orange spots. The belly is relatively translucent clear to yellow and it is possible to see gills and internal organs under the skin.

Tai l

Short and rounded.

APPROXIMATE MAXIMUM SIZE

Medium: < 1.4 inches, 35mm.



OAKTOAD

Bufo quercicus



HABI TAT

Shallow, semi-permanent, temporary fishless ponds. Lives in well drained uplands such as sandy pine scrublands and pinewoods.

BREEDING SEASON

Spring/Summer, April-September

SI MI LAR TADPOLES

Bufo terrestris, Scaphiopus holbrookii





Ventral view

APPEARANCE

Head

Dorsal eyes. There is a black spot over each eye and nostril. The snout curves abruptly downward.

Body

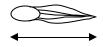
These small tadpoles are dark olive or grayish to almost black with a lighter belly. A mid-dorsal line may be apparent

Tai l

The tail has a low arch and a series of distinct white bands along the tail muscle with clear to slightly spotted fins.

APPROXIMATE MAXIMUM SIZE

Small: 0.9 inches, 24mm.



SOUTHERNTOAD

Bufo terrestris



HABI TAT

In many different habitats from sandy areas along lakes and ponds, to wooded hammocks and highland scrub.

BREEDI NG SEASON

Spring/Summer, March-September

SI MI LAR TADPOLES

Bufo quercicus, Bufo marinus, Scaphoipus Holbrookii



APPEARANCE

Head

Dorsal close set eyes.

Body

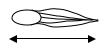
Bufo terrestris tadpoles are dark and broad . Their body is wider near the vent than the eyes. The whole body including the belly is dark with golden lines under each eye that extend diagonally upwards

Tai l

The tail is short and rounded and the fins are clear with light mottling along the edges.

APPROXIMATE MAXIMUM SIZE

Small: 0.9 inches, 24mm.

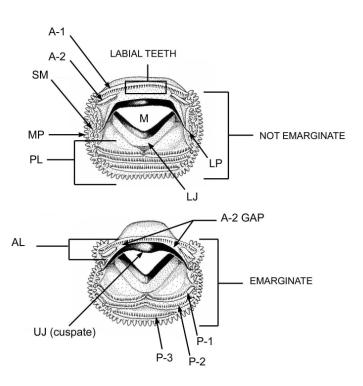


TADPOLE MOUTHPARTS

Examination of tadpole mouthparts can be useful for distinguishing some species of tadpoles. These illustrations depict the oral disc of twelve tadpoles viewed with a dissecting scope.

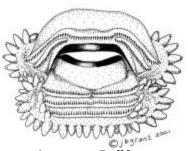
All illustrations by Jacqualine Grant (reprinted from Dodd, 2004).

GENERAL TADPOLE MOUTHPART MORPHOLOGY

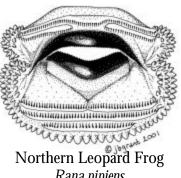


ILLISTRATIONS OF MOUTHPARTS OF 12 SPECIES OF TADPOLES

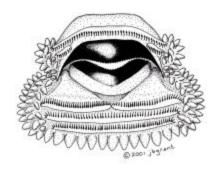
Rani dae-True Frogs



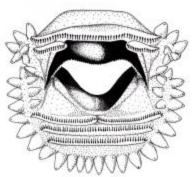
American Bullfrog Rana catesbeiana



Rana pipiens

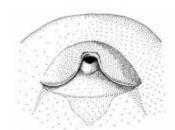


Bronze Frog Rana clamitans



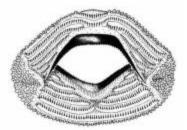
Pickerel Frog Rana palustris

Microhylidae-Narrowmouth Toad



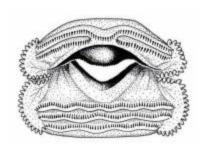
Eastern Narrow mouthed Toad Gastrophryne carolinensis

Pel obati dae-Spadefoot Toad

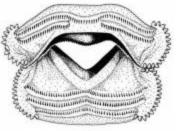


Eastern Spadefoot Scaphiopus holbrookii

Bufoni dae-True Toads



American Toad Bufo americanus

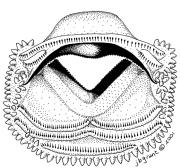


Fowler's Toad

Bufo fowleri

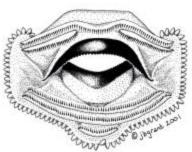


Spring Peeper Pseudacris crucifer

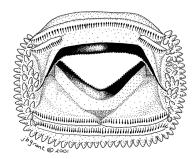


Cope's Gray Treefrog

Hyla chrysoscelis



Upland Chorus Frog Pseudacris feiarum



Northern Cricket Frog *Acris crepitans*

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